

APPENDIX I

CONTRACTIONS

ACCRY	Accuracy	LLCC	Low-Level Circulation Center
ACFT	Aircraft	LVL	Level
ADP	Automatic Data Processing	M	Meter(s)
AFGWC	Air Force Global Weather Central	M/SEC	Meters per Second
AIREP	Aircraft Weather Report(s) (Commercial and Military)	MAX	Maximum
ANT	Antenna	MB	Millibar(s)
APT	Automatic Picture Transmission	MET	Meteorological
ARWO	Aerial Reconnaissance Weather Officer	MIN	Minimum
ATT	Attenuation	MSN	Mission
AVG	Average	NAV	Navigational
AWN	Automated Weather Network	NAVPGSCOL	Naval Postgraduate School
BPAC	Blended Persistence and Climatology	NEDN	Naval Environmental Data Network
BRG	Bearing	NEDS	Naval Environmental Display Station
CDO	Central Dense Overcast	NEPRF	Naval Environmental Prediction Research Facility
CI	Current Intensity	NESS	National Environmental Satellite Service
CLD	Cloud	NET	Near Equatorial Trough
CLSD	Closed	NM	Nautical Mile(s)
CNTR	Center	N/O	Not Observed
CPA	Closest Point of Approach	NOAA	National Oceanic and Atmospheric Administration
DEG	Degree(s)	NRL	Naval Research Laboratory
DIAM	Diameter	NTCC	Naval Telecommunications Center
DIR	Direction	NTCM	Nested Tropical Cyclone Model
DMSP	Defense Meteorological Satellite Program	OBS	Observation(s)
ELEV	Elevation	OTCM	One-Way Interactive Tropical Cyclone Model
FLT	Flight	PCN	Position Code Number
FNOC	Fleet Numerical Oceanography Center	PSBL	Possible
GOES	Geostationary Operational Environmental Satellite	PTLY	Partly
HGT	Height	QUAD	Quadrant
HPAC	Mean of XTRP and Climatology	RADOB	Radar Observation
HR	Hour(s)	RECON	Reconnaissance
HVY	Heavy	RNG	Range
ICAO	International Civil Aviation Organization	SAT	Satellite
IR	Infrared	SFC	Surface
KM	Kilometer(s)	SLP(MSLP)	Sea-Level Pressure (Minimum Sea- Level Pressure)
KM/HR	Kilometer(s) per hour	SPOL	Spiral Overlay

SRP	Selective Reconnaissance Program
STNRY	Stationary
SST	Sea Surface Temperature
ST	Super Typhoon
TC	Tropical Cyclone
TCARC	Tropical Cyclone Aircraft Recon- naissance Coordinator
TCFA	Tropical Cyclone Formation Alert
TCM	Tropical Cyclone Model
TD	Tropical Depression
TDO	Typhoon Duty Officer
TIROS	Television Infrared Observation Satellite
TS	Tropical Storm
TY	Typhoon
TUTT	Tropical Upper Tropospheric Trough (Sadler, 1976)
ULAC	Upper-Level Anticyclone
VEL	Velocity
VIS	Visual
VSBL	Visible
WESTPAC	Western Pacific
WMO	World Meteorological Organization
WND	Wind
WRS	Weather Reconnaissance Squadron
XTRP	Extrapolation
Z	Zulu Time (Greenwich mean time)

APPENDIX II

DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement.

CENTER - The vertical axis or core of a tropical cyclone. Usually determined by wind, temperature, and/or pressure distribution.

CYCLONE - A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the northern hemisphere).

EPHEMERIS - Position of a body (satellite) on space as a function of time; used when no geographic reference is available for gridding satellite imagery. Since ephemeris gridding is based solely on the theoretical position of the satellite, it is susceptible to errors from vehicle pitch, orbital eccentricity, and the oblateness of the earth.

EXPLOSIVE DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 mb/hr for 12 hrs or 5.0 mb/hr for 6 hrs (ATR 1971).

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy sources from release of latent heat of condensation, to baroclinic processes. The term carries no implications as to strength or size.

EYE - "EYE" is used to describe the central area of a tropical cyclone when it is more than half surrounded by wall cloud.

FUJIWHARA EFFECT - An interaction in which tropical cyclones within about 700 nm (1296 km) of each other begin to rotate cyclonically about one another. When intense tropical cyclones are within about 400 nm (741 km) of each other, they may also begin to move closer to each other.

MAXIMUM SUSTAINED WIND - Maximum surface wind speed averaged over a 1-minute period of time. Peak gusts over water average 20 to 25 percent higher than sustained wind.

RAPID DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 1.25 mb/hr for 24 hrs (ATR 1971).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west or northwest to the north then northeast.

RIGHT ANGLE ERROR - The distance described by a perpendicular line from the best track to a forecast position.

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUPER TYPHOON/HURRICANE - A typhoon/hurricane in which the maximum sustained surface wind (1-minute mean) is 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection--generally 100 to 300 nm (185-556 km) in diameter--originating in the tropics or subtropics, having a non-frontal migratory character, and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages or intensification, may be classified as a tropical depression, tropical storm or typhoon (hurricane).

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds (1-minute mean) in the range of 34 to 63 kt (17-32 m/sec) inclusive.

TROPICAL UPPER TROPOSPHERIC TROUGH (TUTT) - "A dominant climatological system, and a daily synoptic feature, of the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans," from Sadler, James C., Feb. 1976: Tropical Cyclone Initiation by the Tropical Upper Tropospheric Trough (NAVENVPREDRSCHFAC Technical Paper No. 2-76).

TYPHOON/HURRICANE - A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 64 kt (33 m/sec) or greater. West of 180 degrees longitude they are called typhoons and east of 180 degrees they are called hurricanes. Foreign governments use these or other terms for tropical cyclones and may apply different intensity criteria.

VECTOR ERROR - The vector drawn between a forecast position and the location of the storm at the verifying time of the forecast.

WALL CLOUD - An organized band of cumuliiform clouds immediately surrounding the central area of a tropical cyclone. The wall cloud may entirely enclose the eye or only partially surround the center.

APPENDIX III

REFERENCES

- Arnold, C. P., 1974: Tropical Cyclone Position and Intensity Analysis using Satellite Data. First Weather Wing Pamphlet, 1WWP 105-10, Department of the Air Force, Hq 1st Weather Wing (MAC), 88 pp.
- Atkinson, G. D., and Holliday C. R., 1977: Tropical Cyclone Minimum Sea-Level Pressure - Maximum Sustained Wind Relationship for Western North Pacific. Monthly Weather Review, Vol. 105, No. 4, pp. 421-427.
- Burroughs, L. D. and Brand, S., 1973: Speed of Tropical Storms and Typhoons After Recurvature in the Western North Pacific Ocean. Journal of Applied Meteorology, Vol. 12, No. 3, pp. 452-458.
- Dunnavan, G. M., 1981: Forecasting Intense Tropical Cyclones Using 700-MB Equivalent Potential Temperature and Central Sea-Level Pressure, NAVOCEANCOMCEN/JTWC TECH NOTE 81-1, 12 pp.
- Dvorak, V. F., 1973: A Technique for the Analysis and Forecasting of Tropical Cyclone Intensities from Satellite Pictures, NOAA TM NESS 45, 19 pp.
- Ruprecht, E., and Gray, W. M., 1976: Analysis of Satellite-Observed Tropical Cloud Clusters, Part I: Wind and Dynamic Fields. Tellus, 28, 391-413.
- Sadler, J. C., 1976: Tropical Cyclone Initiation by the Tropical Upper Tropospheric Trough, NAVENVPREDRSCHFAC Technical Paper No. 2-76, 103 pp.
- Sikora, C. R., 1976: A Reevaluation of the Changes in Speed and Intensity of Tropical Cyclones Crossing the Philippines, FLEWEACEN TECH NOTE: JTWC 76-2, 11 pp.

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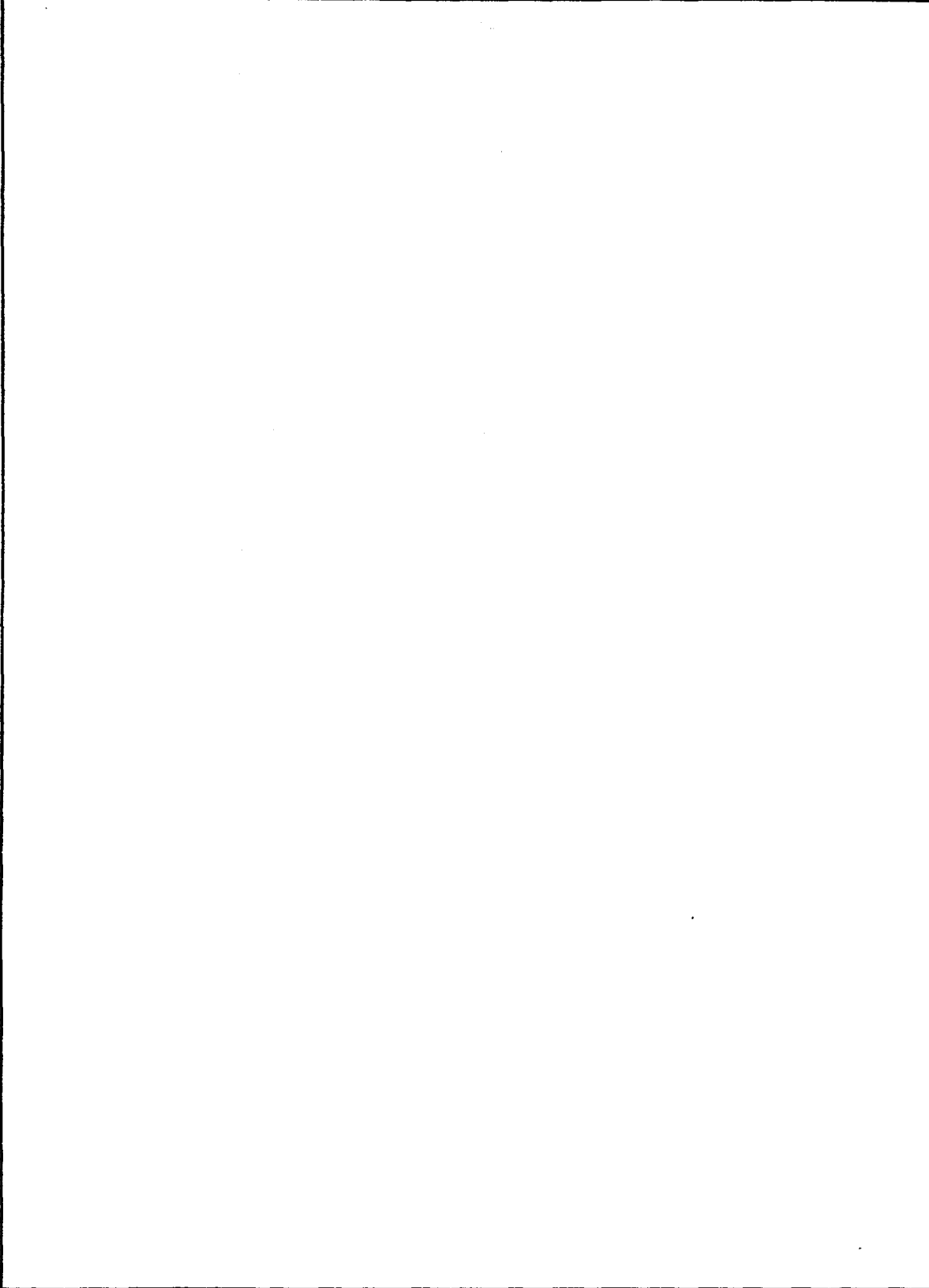
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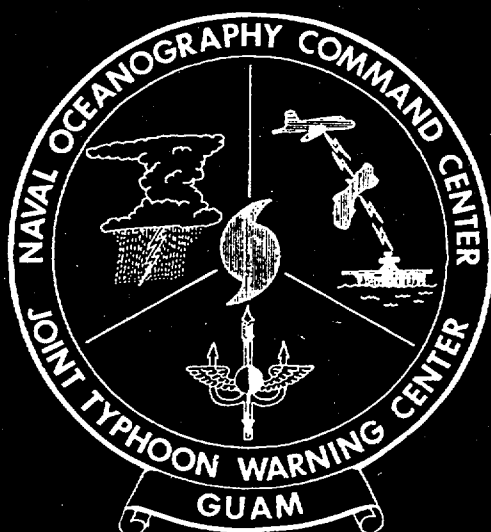
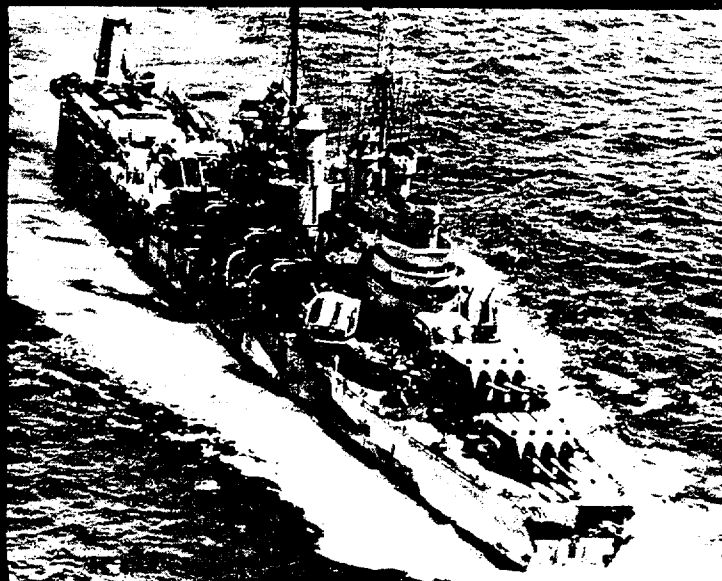
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